

Resource Capability Evaluation Model Pilot Test: Measuring the Adequacy of Air, Land, Water, and Spectrum Resources to Meet Operational Requirements

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Introduction and Background

The Resource Capability Evaluation Model came into being as one means of supporting the Secretariat's strategic goal of having "mission ready installations and ranges". In order to be mission ready at the installation and training range level, the Air Force needs an adequate supply of air, land, water, and spectrum resources to train and perform its mission. While the Air Force needs and seeks adequate supplies of air, land, water, and spectrum resources to train and perform missions, in some cases resources are being degraded due to environmental and other encroachment pressures, such as population growth and urbanization, potentially impacting mission readiness. The degradation of air, land, water, and spectrum resources due to the cumulative impact of encroachment can, in turn, result in diminished operations and situations where significant workarounds, inconveniences, and additional costs of doing business emerge. To date, encroachment response efforts have been hampered by the lack of a consistent methodology to measure and report resource degradation/denial situations at ranges or installations. The ability to measure resource degradation would provide more visibility of these situations and would be an important step in better understanding the impact of limited resources on missions.

In September, 2002, SAF/IEE requested funding for the development of a capability-based framework or model to accomplish three objectives. First, to develop and pilot test a methodology to measure the readiness or "adequacy" of air, land, water, and spectrum to meet operational needs. Framed as a question, "are available air, land, water, and spectrum resources adequate, more than adequate, or less than adequate to meet operational needs." Second, to identify and quantify encroachment pressures denying or degrading resource availability. And third, in instances where encroachment pressures are not present, the objective was to identify and quantify resource opportunities to support operations.

The Resource Capability Evaluation Model was developed in its initial form in September and October, 2002. It was briefed to a variety of agencies and organizations inside and outside the Air Force in November to explain the concept and to capture inputs and suggestions from these parties. The Pilot test location, Shaw AFB, SC, was identified with the help of XOO in late November. In December, 2002, draft metrics were prepared as part of the development of a questionnaire to guide pilot test efforts. In January, the pilot test team updated air, land, water, and spectrum metrics and the questionnaire based on inputs from HQ ACC. SAF/IEE and its support contractor then visited Shaw AFB in January, 2003, which included an in-brief, multiple working sessions, and an out-brief.

Methods

The Resource Capability Evaluation Model methodology begins with the needs of the operational community within the Air Force. These needs or requirements, defined for instance in the Ready Aircrew Program (RAP) and in Command and base-level Air Force Instructions, drive the need for air, water, land, and spectrum resources to support training. While this can be a very complicated process, articulating operational requirements is the first step in the methodology. Once operational requirements are defined, the second step in the methodology is to

determine corresponding air, land, water, and spectrum resource requirements at a particular installation or range. It may be, for example, that training requirements call for training activities during the day and night that will ultimately require additional access to airspace or surface lands (from flyovers), resulting in additional noise impacts. Hence, there is a direct link between operational requirements and required air, land, water and spectrum resources. Defining this link is critical. Without it, it is difficult for the Air Force to articulate a basis for the air, land, water, and spectrum resources it needs.

The third step the Resource Capability Evaluation Model methodology is to determine “resource availability”. The question that is being asked is “what air, land, water, and spectrum resources are currently available at a range or installation to support mission activities?” The answer to this step of the process requires information on resource conditions. Once resource requirements are determined, they are compared with available resources at an installation or range for a set of air, land, water, and spectrum resource categories. These are: airspace, air shed emissions availability, surface land access, subsurface land access, sea space, surface water discharge availability, surface water access (supply), groundwater access (supply), groundwater discharge availability, and spectrum. Out of this comparison comes a “resource readiness rating” based on defined breakpoints, the fourth step in the methodology.

There are four metrics that were tested for measuring the adequacy or readiness of airspace to meet operational requirements. Metric 1 is referred to as the “compatible volume” metric, and is the recommended metric to be used to measure airspace encroachment by HQ ACC. Metric 2 is referred to as the “hours” metric, metric 3 the “optimum distance” metric, and metric 4 the “minimum size dimensions” metric. Metric 4 requires the determination of minimum required airspace dimensions based on sortie type and Mission Design Series (i.e., weapon system type), and then compares the desired dimensions in cubic nautical miles to existing units of airspace available to the base, also in cubic nautical miles. There is currently no standard requirement or method in the Air Force for applying this metric, hence, the metric was applied using tactical calculations by the 20th Fighter Wing staff.

There is one metric for air shed emissions availability, two metrics for surface/subsurface land access, and one for sea space (not applicable at the pilot test location) and water supply.

There are two metrics for surface water discharge availability. For spectrum, there are two metrics given that there is no standard measure in use for quantifying spectrum encroachment and/or opportunity. The first looks at total required frequency assignments versus available assignments, as well as VHF and UHF bands as possible “indicator” bands for encroachment pressures. The second metric looks regionally at potentially available frequencies within a 100KM on the base.

Results

The pilot test evaluated the adequacy of air, land, water, and spectrum resources to meet operational requirements at the installation, Poinsett Electronic Combat Range, and four units of airspace used by the 20th Fighter Wing at Shaw AFB. Detailed instructions, metrics, and questions that comprise the pilot test of the Resource Capability Evaluation Model are provided in a Guide/Questionnaire developed during the pilot test. In summary, most data used in air, land, water, and spectrum measurements exists in base documents, include General Plans, Environmental Assessments, land use studies, and natural and cultural resource management plans.

Airspace data collection/resource calculation for Sizing Airspace (Metric 4) was not straightforward, however. Required airspace dimensions were developed by 20th Fighter Wing staff for Basic Surface Attack and Close Air Support as an example. Airspace and surface land encroachments were identified at the installation and range and can be quantified. Water supply, water discharge, and spectrum resource opportunities were identified at the installation and range and can be quantified.

Metrics used were understood and generally accepted as useful measures by HQ ACC and Shaw AFB. Metrics for airspace and frequency spectrum have strengths and weaknesses. The Air Force is in the process of considering an additional pilot test to replicate the experience at Shaw AFB and is planning to incorporate the Resource Capability Evaluation Model into the sustainment, restoration, and modernization process in place for facilities as part of its’ business transformation initiatives.